# DIVISION 2

# SITE WORK

SECTION 02080

# ABANDONMENT, REMOVAL AND DISPOSAL OF EXISTING PIPE REMOVED FROM SERVICE

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Scope of work: Furnish all labor, materials, equipment and incidentals required to abandon or place out of service, remove, salvage and/or dispose of existing water main pipelines as shown on the Drawings and as specified herein.

B. Definitions:

1. Pipeline Abandonment/Pipeline Placed out of Service - isolate from active pipelines, remove from service, dispose of pipeline contents, plug pipeline, fill pipeline with specified cementiceous material, leave pipe in place.

2. Pipeline Removal - isolate from active pipelines, remove from service. Dispose of pipeline contents, remove pipe, valves, fittings, dispose or stockpile removed materials as required.

### 1.02 QUALITY ASSURANCE

A. Permits and Licenses: Contractor shall obtain and pay respective fees for all necessary permits and licenses for performing the work and shall furnish a copy of same to the Engineer prior to commencing the work. The Contractor shall comply with the requirements of the permits.

B. Notices: Contractor shall issue written notices of planned work to companies or local authorities owning utility conduit, wires or pipes running to or through the project site. Copies of said notices shall be submitted to the Engineer.

C. Standards:

1. National Emission Standards Hazardous Air Pollution (NESHAP), 40 CFR Part 61, Subpart M, latest revision.

2. Occupational Safety and Health Act, 29 CFR.

3. The Environmental Protection Agency (EPA) Asbestos Abatement Worker Protection Rule.

4. Florida Statutes.

D. Quality Control

1. It shall be the responsibility of the Contractor to provide supervision and inspections to ensure that the existing piping is removed and disposed, salvaged or abandoned or placed out of service as designated in the Drawings and as specified herein.

1.03 SUBMITTALS

A. Shop Drawings - Submitted to the Engineers acceptance prior to construction in accordance with Section 01340 for the following:

1. Grout – See Section 03600 requirements.

2. Caps and plugs.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION

3.01 REMOVAL, ABANDONMENT AND DISPOSAL

A. General: Existing piping designated on the Drawings to be removed shall be exposed and removed by the Contractor in accordance with the requirements specified herein.

B. Potential types of pipe to be removed and/or abandoned in place or placed out of service:

1. Ductile Iron/Cast Iron, PVC, PE, AC or PCCP Water Mains

C. Removal and Disposal:

1. Pipe designated to be removed and disposed by the Contractor shall be completely drained and the contents properly disposed. The pipe shall then be completely removed from the site, including fittings, valves other in-line devices.

2. The Contractor shall be required to submit, obtain and pay for all necessary permit fees for piping removal and disposal.

3. If manufacturer's representatives are required for portions of piping that is to be removed on the plans (such as but not limited to PCCP piping), the Contractor shall be required to coordinate and pay for all costs associated with the manufacturer's representatives review, field review, submittal documents and other efforts as necessary for the piping removal and/or replacement or repairs.

D. Removal of material to be salvaged:

1. Pipe, fire hydrants, and valves to be removed and salvaged as directed by the City shall be completely drained and the contents properly disposed. The pipe shall then be thoroughly pressure washed, palletized on wooden skids to a dimension not exceeding the recommendation of the manufacturer, and conveyed to the City at the location designated by the City at no cost to the City.

E. Abandonment/Placed out of Service:

1. All pipe designated to be abandoned on this project shall be left in place and placed out of service. Piping that is 6-inches in diameter and larger shall be filled with grout in accordance with Section 03600, Grouting.

2. Plugs: Pipe to be grouted shall be capped or plugged with a fitting. All caps and plugs shall be submitted to the Engineer for approval. Existing pipe shall be properly restrained per the restrained joint table requirements with thrust collars or manufactured restraints based on conditions that result from cutting pipes and/or closing valves to grout pipe to be abandoned or placed out of service.

END OF SECTION

SECTION 02100

CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish all materials, equipment and labor necessary to complete all clearing and grubbing as specified herein and in accordance with the Drawings.

B. The Contractor shall box and protect all trees, shrubs, lawns, and landscaping. Any damaged trees or landscaping shall be restored at the Contractor's cost.

1.02 STANDARDS AND REGULATIONS

A. The Contractor shall comply with all state, county and local regulations regarding disposal of debris resulting from the clearing and grubbing operation.

B. The Contractor shall dispose of debris resulting from the clearing and grubbing operation at off-site locations in a lawful manner.

1.03 PROTECTION OF PERSONS AND PROPERTY

A. All work shall be performed in such a manner to protect all personnel, workmen, pedestrians, and adjacent property and structures from possible injury or damage.

B. Required wind load calculation for equipment mounted outside. Contractor to submit equipment support detail for approval.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

A. The Work specified in this section consists of clearing and grubbing within the areas required in the easements and right-of-ways to install the pipeline and appurtenances. The Work shall include the disposal of the resultant products and debris in areas provided by the Contractor unless noted otherwise.

B. Property obstructions which are to remain in place, such as buildings, sewers, drains, pipelines, conduits, poles, walls, posts, bridges, etc., are to be carefully

protected from injury and are not to be displaced, except for unusual cases when so specified by the Engineer.

C. Standard clearing and grubbing shall consist of the complete removal and disposal of all trees, shrubs, timber, brush, stumps, roots, grass, weeds, rubbish and other obstructions resting on or protruding through the surface of the existing ground and the surface of excavated areas.

D. Excavation resulting from the removal of trees, roots, and the like shall be filled with suitable material, as approved by the Engineer, and thoroughly compacted per the requirements contained in Section 02222, Excavation and Backfill for Utilities and Structures.

3.02 DISPOSAL OF MATERIALS

A. Timber, stumps, muck, brush, roots, rubbish and other objectionable material resulting from clearing and grubbing shall be disposed of in a lawful manner, off site by the Contractor.

B. Burning of any debris resulting from the clearing and grubbing work will not be permitted at the site.

END OF SECTION

SECTION 02140

DEWATERING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Design, furnish, operate, maintain, and remove temporary dewatering systems to control groundwater and surface water to maintain stable, undisturbed subgrades, and permit work to be performed under dry and stable conditions. Work to be done as part of dewatering includes, but is not limited to:

1. Lower the groundwater level

2. Lower hydrostatic pressure.

3. Sampling and discharge requirements.

4. Prevent surface water from entering the excavation during construction.

5. Implement erosion control measures for disposing of discharge water.

B. Groundwater within the excavation area shall be lowered to at least 1 foot below the lowest excavation levels as specified and as indicated.

C. Common groundwater recharge methods include, but are not limited to, deep wells, large sumps or any combination thereof.

D. The Contractor shall obtain the required permits and pay any associated permit fees for the discharge from the Contractor's dewatering systems in accordance with Miami-Dade County and South Florida Water Management District (SFWMD) requirements and all other jurisdictional agencies as necessary. The Contractor shall conform with all permit requirements. In addition, the Contractor is to make themselves aware of all potentially contaminated sites per the Miami-Dade County contaminated site database website. As their website is updated regularly, the Contractor shall be responsible to review the latest contaminated site listing and allow time for any initial monitoring, dewatering sampling/testing and subsequent permitting time frames if there is evidence of groundwater contamination in the dewatering samples. No delay claims will be allowed for the Contractor's lack of initial due diligence and/or installation of monitoring wells for sampling of dewatering discharge if not implemented prior to commencement of construction such that necessary measures and permitting efforts/submittals can be performed without impact to the project schedule.

1.02 RELATED WORK

A. Section 02160 – Temporary Excavation Support Systems

B. Section 02222 – Excavation and Backfill for Utilities and Structures

C. Section 02225 – Contaminated Soils and Groundwater

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01340, Shop Drawings:

1. Qualification of the Contractor’s dewatering specialist's or firm's qualifications a minimum of four (4) weeks prior to execution of any dewatering. The submittal shall include, but not be limited to:

a. Qualifications of specialist's or firm's Registered Professional Engineer as specified in Paragraph 1.04 B.

b. Qualifications of specialist's or firm's field representative, as specified in paragraph 1.04 B, who shall oversee the installation, operation and maintenance of the dewatering system.

2. Submit a dewatering plan at least two weeks prior to start of any dewatering operation. Do not submit design calculations. The review will be only for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include the following items as a minimum:

a. Dewatering plan and details stamped and signed by a Registered Professional Engineer.

b. Certificate of Design: Refer to Section 01340, Shop Drawings.

c. A list of equipment including, but not limited to, pumps, prime movers, and standby equipment.

d. Detailed description of dewatering, maintenance, and system removal procedures.

e. Monitoring plan and details, including, but not limited to, number and locations of observation wells, and geotechnical instruments such as settlement markers and piezometers, and frequency of reading the monitoring devices.

f. Erosion/sedimentation control measures, and methods of disposal of pumped water. Sampling of dewatering discharge and meeting the required permitting agency parameters.

g. List of all applicable laws, regulations, rules, and codes to which dewatering design conforms.

h. List of assumptions made for design of dewatering and for groundwater recharge systems, including but not limited to groundwater levels, soil profile, permeability, and duration of pumping and or recharge.

i. Turbidity measurements in receiving waters as required by the permit. A turbidity control and monitoring where discharge is to a body of water.

3. Measurement records consisting of observation well groundwater records and the geotechnical instrumentation readings within one day of monitoring.

4. A modified dewatering plan within 24 hours, if open pumping from sumps and ditches results in boils, loss of fines, sinkholes or softening of the ground.

1.04 QUALITY ASSURANCE

A. Employ the services of a dewatering specialist or firm having the following qualifications:

1. Have completed at least five (5) successful dewatering projects of equal size and complexity and with equal systems within the last five (5) years.

2. Retain the services of a Florida Registered Professional Engineer having a minimum of five (5) years of experience in the design of well points, deep wells, or equal systems.

3. Retain the services of a field representative having a minimum of five (5) years of experience in installation of well points, deep wells, or equal systems.

B. If subgrade soils are disturbed or become unstable due to dewatering operation or an inadequate dewatering system, notify the Owner's representative, stabilize the subgrade, and modify system to perform as specified at no additional cost to the Owner.

C. Notify the Owner's representative immediately if any settlement or movement is detected on structures. If the settlement or movement is deemed by the Owner's representative to be related to the dewatering, take actions to protect the adjacent structures and submit a modified dewatering plan to the Owner's representative within 24 hours. Implement the modified plan and repair any damage incurred to the adjacent structures at no additional cost to the Owner.

D. If oil and/or other hazardous materials are encountered after dewatering begins, immediately notify the Owner's representative.

1.05 DELIVERY, STORAGE AND HANDLING

A. Provide in accordance with the Contract documents.

1.06 PROJECT/SITE CONDITIONS

A. Subsurface Conditions: Refer to Geotechnical Report provided specifically for the project. The Contractor is responsible for investigating existing soil conditions as the Geotechnical Report does not assure all subsurface site conditions are represented.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide settlement markers, observation wells, piezometers and/or any other geotechnical instruments in accordance with the submitted dewatering plan.

B. Provide casings, well screens, piping, fittings, pumps, power and other items required for dewatering system.

C. Provide sand and gravel filter around the well screen. Wrapping geotextile fabric directly around the well screen shall not be allowed.

D. When deep wells, well points, or vacuum well points are used, provide pumping units capable of maintaining high vacuum and handling large volumes of air and water at the same time.

E. Provide and store auxiliary dewatering equipment, consisting of pumps and hoses on the site in the event of breakdown, at least one (1) pump for every five (5) used.

F. Provide and maintain erosion/sedimentation control devices as indicated or specified and in accordance with the dewatering plan.

G. Provide temporary pipes, hoses, flumes, or channels for the transport of discharge water to the discharge location.

H. Provide cement grout having a water cement ratio of 1 to 1 by volume.

I. Provide for dewatering discharge sampling as required by regulatory agencies. All sampling and permit fees are to be paid by the Contractor.

J. Sampling parameters must meet regulatory standards prior to dewatering discharge. The Contractor is required to pay for all sampling and testing, including permitting efforts as necessary for dewatering discharge of groundwater.

## PART 3 - EXECUTION

### 3.01 EXECUTION

A. Execution of any earth excavation, installing earth retention systems, and dewatering shall not commence until the related submittals have been reviewed by the Owner' representative with all Owner's representative comments satisfactorily addressed and the geotechnical instrumentation has been installed.

B. Furnish, install and maintain dewatering system in accordance with the dewatering plan and regulatory requirements.

C. Carry out dewatering program in such a manner as to prevent undermining or disturbing foundations of existing structures or of work ongoing or previously completed.

D. Do not excavate until the dewatering system is operational.

E. Unless otherwise specified, continue dewatering uninterrupted until all structures, pipes, and appurtenances below groundwater level have been completed such that they will not be floated or otherwise damaged by an increase in groundwater elevation.

F. Discontinue open pumping from sumps and ditches, if such pumping is resulting in boils, loss of fines, softening of the ground, or instability of the slopes. Modify dewatering plan and submit to the Owner's representative and required regulatory agencies at no additional cost to the Owner.

G. Where subgrade materials are disturbed or become unstable due to dewatering operations, remove and replace the materials in accordance with Section 02210, Earth Excavation, Backfill, Fill and Grading, at no additional cost to the Owner.

H. Dewatering Discharge:

1. Install and monitor recharge systems when specified and/or indicated and in accordance with the submitted dewatering plan.

2. Install sand and gravel filters in conjunction with well points and deep wells to prevent the migration of fines from the existing soil during the dewatering operation.

3. Transport pumped or drained water to discharge location without interference to other work, damage to pavement, other surfaces, or property.

4. Provide separately controllable pumping lines.

5. The Owner's representative reserves the right to sample discharge water at any time. The Contractor is required to meet all regulatory requirements for sampling and sampling parameters, prior to dewatering discharge.

6. Immediately notify the Owner's representative if suspected contaminated groundwater is encountered. Do not pump water found to be contaminated with oil or other hazardous material to the discharge locations.

I. Monitoring Devices and Records:

1. Install, maintain, monitor and take readings from the observation wells and geotechnical instruments in accordance with the dewatering plan.

2. Install settlement markers on structures within the zone of influence for dewatering a distance equal to twice the depth of the excavation, from the closest edge of the excavation. Conduct and report settlement surveys to 0.01 feet.

3. For large rectangular, square or circular mass excavations the zone of influence shall be defined by the actual cone of watering influence corresponding to a 10% increase in effective vertical stress.

J. Install and maintain erosion/sedimentation control devices at the point of discharge and in accordance with the dewatering plan and regulatory requirements.

K. Removal:

1. Do not remove dewatering system without written approval from the Engineer, and/or the City.

Backfill and compact sumps or ditches with clean fill in accordance with the specifications herein.

2. All dewatering wells shall be abandoned upon completion of the work, and completely backfilled with cement grout.

3.02 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02160

TEMPORARY EXCAVATION SUPPORT SYSTEMS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Design, furnish and install temporary excavation support systems as required to maintain lateral support, prevent loss of ground, limit soil movements to acceptable limits and protect from damage existing and proposed improvements including, but not limited to, pipelines, utilities, structures, roadways, railroads and other facilities.

B. Common types of excavation support system include, but are not limited to, singular or multiple stages comprised of cantilevered or internally braced soldier piles and lagging, steel sheet pile wall, timber sheet pile wall, trench box, or combinations thereof. Trench box temporary excavation support system is only acceptable for pipe or utility trench excavations. Temporary unsupported open cut excavation with stable sloping sides is allowed where applicable.

C. Wherever the word "sheeting" is used in this section or on the contract drawings, it shall be in reference to any type of excavation support system specified except trench box.

D. Construction of the temporary excavation support systems shall not disturb the existing structures or the completed proposed structures. Damage to such structures shall be repaired by the Contractor at no additional cost to the City.

E. Adjacent structures are those that bear upon soils above the proposed excavation depth and within a distance equal to twice the total depth of the excavation away from the closest edge of the excavation. Monitor and protect adjacent structures as specified and indicated.

F. Vibration monitoring for excavation support systems will be performed by Contractor's vibration consultant and monitoring firm. Vibration due to Contractor's operations shall not exceed specified limits 1.05 E.

G. Construction operations not to exceed specified noise limits in accordance with the City's Noise Ordinances.

H. The Contractor shall bear the entire cost and responsibility of correcting any failure, damages, subsidence, upheaval or cave-ins as a result of improper installation, maintenance or design of the temporary excavation support systems. The Contractor shall pay for all claims, costs and damages that arise as a result of the work performed at no additional cost to the City.

I. All excavation support systems are to be designed and installed in conformance with the latest OSHA requirements.

**1.02** RELATED WORK

A. Section 02210 – Earth Excavation, Backfill, Fill and Grading

B. Section 02222 – Excavation and Backfill for Utilities and Structures

C. Section 03300 – Cast in Place & Precast Concrete, Reinforcing and Formwork

**1.03** REFERENCES

A. American Society for Testing and Materials (ASTM):

1. A36: Standard Specification for Structural Steel.

2. A328: Standard Specification for Steel Sheet Piling.

3. A416: Standard Specification for Strand Steel, Uncoated Seven-Wire for Prestressed Concrete.

4. A722: Specification for Uncoated High-Strength Steel Bar for Prestressing Concrete.

5. A615: Standard Specifications for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

B. American Wood-Preserves Association (AWPA) Standards.

C. American Welding Society (AWS) Code: D1.1.

D. Federal Standard, FS TT-W-571: Wood Preservation and Treating Practices.

E. Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29: Subpart P - Excavations, Trenching and Shoring.

F. American Concrete Institute (ACI)

1. ACI 304: Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

**1.04** SUBMITTALS

A. Submit the following in accordance with Section 01340:

1. Submit the following qualifications four (4) weeks prior to the construction:

a. Qualifications of independent vibration consulting and monitoring firm as specified in Paragraph 1.05 D.
b. Qualifications of Contractor's temporary excavation support system designer as specified in Paragraph 1.05 G.
c. Qualifications of Contractor's temporary excavation support system installer as specified in Paragraph 1.05 H.
d. Qualifications of Contractor's independent tieback testing laboratory as specified in Paragraph 1.05 I, if a tieback system is utilized.
e. Qualifications of Contractor's temporary excavation support system installation supervisor as specified in Paragraph 1.05 J.
f. Qualifications of vacuum excavation subcontractor as specified in Paragraph 1.05 F, if drilled micro piles (DMPs) for utilities are utilized.

2. Submit a temporary excavation support plan stamped and signed by a Registered Professional Engineer at least two weeks prior to start of the construction. Do not submit design calculations. The review will be only for the information of the City and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include the following items as a minimum

a. Proposed temporary excavation support system(s), details, location, layout, depths, extent of different types of support relative to existing features and the permanent structures to be constructed, and methods and sequence of installation and removal.
b. Certificate of Design: Refer to Section 01340.
c. A list of all design assumptions, including safety factors used for the temporary excavation support system(s) and all lateral pressures used for each system.
d. If utilizing a tieback system, include tieback installation procedures and criteria for acceptance of tiebacks for performance and proof tests. Submit the tieback testing results to the Engineer for information only.
e. Requirements of dewatering during the construction.
f. Minimum lateral distance from the edge of the excavation support system for use for vehicles, construction equipment, and stockpiled construction and excavated materials.
g. List of equipment used for installing the excavation support systems.
h. Monitoring schedule, installation procedures and location plans for vibration/noise monitoring, geotechnical instrumentation (deformation monitoring points, inclinometers, etc.) and observation wells/piezometers to monitor ground, excavation support system,

adjacent structures and groundwater fluctuation during the entire construction period.

3. Submit a Construction Contingency Plan specifying the methods and procedures to maintain temporary excavation support system stability if the allowable movement of the adjacent ground and adjacent structures is exceeded.

4. Monitoring data within one (1) day of data collection from vibration and noise recording equipment, observation wells, and deformation monitoring points and offset lines. Data shall include:

   a. Horizontal and vertical movements of geotechnical instruments and groundwater readings.
   b. New movements since the initial readings of the geotechnical instruments.
   c. Weekly summary in tabular and graphic form at the end of each week.
   d. A schematic plan of excavation and/or relevant construction activities at the time of monitoring.

5. For excavation support systems left in place, submit the following as-built information prior to backfilling and covering the excavation support systems:

   a. Survey locations of the temporary excavation support systems, including coordinates of the ends and points of change in direction.
   b. Type of the temporary excavation support system.
   c. Elevations (NAVD 88, or as applicable for the current survey datum) of top and bottom of the excavation support systems left in place.

## 1.05 QUALITY ASSURANCE

A. Conform to the requirements of the OSHA Standards and Interpretations: "Part 1926 Subpart P - Excavation, Trenching, and Shoring", and all other applicable laws, regulations, rules, and codes.

B. Construction operations to conform to noise regulations provided in the Noise Control Plan and this Section.

C. Retain the services of an independent vibration consulting firm with the following in-house personnel to conduct the following vibration monitoring requirements:

1. Preparing, reviewing and signing of monitoring plans and daily reports, and overseeing of the monitoring and interpretation of the vibration data shall be performed by personnel with the following qualifications:

a. Be a Florida Registered Professional Engineer.
b. Have a minimum of five (5) years' experience in the vibration consulting field.
c. Have successfully completed at least five (5) projects with vibration-inducing construction operations, pile driving, and noise levels equal to or more severe than those to be encountered.

2. Assist Contractor in selecting pile driving equipment which will generate the lowest vibration and noise levels.

3. Installation, monitoring and interpretation of monitoring equipment shall be performed by personnel with the following qualifications:

a. Have at least three (3) years of experience in the operation of monitoring equipment proposed for use and interpretation of records produced by such equipment.
b. Have installed, operated, monitored and interpreted equipment and records on at least three (3) projects with vibration-inducing construction operations, pile driving, and noise levels equal to or more severe than those to be encountered.

D. The peak particle velocity for pile driving, or other vibration-inducing operations, shall not exceed the following:

| Type of Concrete | Age of Concrete, hrs | Peak Particle Velocity in/sec |
|---|---|---|
| Mass Concrete (footings, mats, Slab-on-grade, fill concrete, etc.) | 0-11 | 1.0 |
| | 11 and over | 2.0 |
| Concrete Structures (walls, columns, elevated slabs, etc.) | 0-11 | 0.5 |
| | 11-24 | 1.0 |
| | 24 and over | 2.0 |
| Existing Structures, residences or utilities | - | 0.5 |

E. If utilizing deformation monitoring points (DMPs) for utilities, vacuum excavation shall be performed by subcontractor having five (5) years of experience in non-destructive vacuum excavation methods for utilities.

F. Prepare design, including calculations and drawings, under the direction of a Professional Engineer registered in the state where the project is located and having the following qualifications:

1. Not less than ten (10) years' experience in the design of specific temporary excavation support systems to be used.

2. Completed not less than five (5) successful temporary excavation support system projects of equal type, size, and complexity within the last five (5) years.

G. Temporary Excavation Support System Installer's Qualifications:

1. Not less than three (3) year experience in the installation of similar types and equal complexity as the proposed system.

2. Completed not less than three (3) successful excavation support systems of similar type and equal complexity as the proposed system.

H. If utilizing a tieback system, employ an independent testing laboratory to test the tieback system with the following qualifications:

1. Be accredited by the American Association of State Highway and Transportation Officials (AASHTO) Accreditation Program.

2. Employ personnel conducting testing who are trained in the methods and procedures to test and monitor tieback systems of similar type and equal complexity, as the proposed system.

3. Have not less than five (5) years of experience in testing of tieback systems of similar type and equal complexity as the proposed system.

4. Have successfully tested at least three (3) tieback systems of similar type and equal complexity as the proposed system.

I. Install all temporary excavation support systems under the supervision of a supervisor having the following qualifications:

1. Not less than five (5) years of experience in installation of systems of similar type and equal complexity as the proposed system.

2. Completed at least five (5) successful temporary excavation support systems of similar type and equal complexity as the proposed system.

J. All welding shall be performed in accordance with AWS D1.1.

1.06 DESIGN CRITERIA

A. Design of temporary excavation support systems shall meet the following minimum requirements:

1. Support systems shall be designed for earth pressures, hydrostatic pressure, equipment, temporary stockpiles, construction loads, roadways, railroads, and other surcharge loads.

2. Design a bracing system to provide sufficient reaction to maintain stability.

3. Limit movement of ground adjacent to the excavation support system to be within the allowable ground deformation as specified.

4. Design the embedment depth below bottom of excavation to minimize lateral and vertical earth movements and provide bottom stability. Toe of braced temporary excavation support systems shall not be less than 5 feet below the bottom of the excavation.

5. Design temporary excavation support systems to withstand an additional 2 feet of excavation below proposed bottom of excavation without redesign except for the addition of lagging and/or bracing.

1.07 DELIVERY, STORAGE AND HANDLING

A. Store sheeting and bracing materials to prevent sagging which would produce permanent deformation. Keep concentrated loads which occur during stacking or lifting below the level which would produce permanent deformation of the material.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Structural Steel: All soldier piles, wales, rakers, struts, wedges, plates, waterstop and accessory steel shapes shall conform to ASTM A36.

B. Steel Sheet Piling: ASTM A328, continuous interlocking type.

C. Timber Lagging Left in Place: Pressured treated per appropriate AWPA standards.

D. Tieback Tendons: Tieback tendons shall be high strength steel wire strand cables conforming to ASTM A416, or bars conforming to ASTM A722. Splicing of individual cables shall not be permitted.

E. Raker Ties: ASTM A615 Grade 60.

F. Cement Grout Materials And Admixtures For Tieback Anchorages: Grout cube strength shall be a minimum 3500 psi at 7 days and 5000 psi at 28 days.

G. Tamping tools adapted for backfilling voids after removal of the excavation support system.

H. Provide specific trench box sizes for each pipe and utility excavation with structural capacity of retaining soil types as described in OSHA's standards.

2.02 EQUIPMENT

A. A vibratory hammer shall be utilized for driving the temporary sheet piling providing that such operations do not exceed vibration/noise requirements of the specifications. Impact hammer shall be utilized when vibratory hammer is unable to drive temporary sheet piling to required depth and/or unable to meet vibration requirements. Impact hammer shall also meet noise and vibration requirement.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation of the temporary excavation support systems shall not commence until the related earth excavation and dewatering submittals have been reviewed by the Engineer with all Engineer’s comments satisfactorily addressed.

B. Install excavation support systems in accordance with the temporary excavation support plan.

C. If utilizing a tieback system, all performance and proof tests shall be conducted in the presence of the Engineer. Testing performed without the Engineer or City’s representative present will not be accepted. Repeat testing in the Engineer's presence at no additional cost to the City.

D. Do not drive sheeting within 100 feet of concrete less than seven (7) days old.

E. Carry out program of temporary excavation support in such a manner as to prevent undermining or disturbing foundations of existing structures of work ongoing or previously completed.

F. Bottom of the trench box excavation support system shall be above the pipe invert prior to installing the pipe.

G. Install and read geotechnical instrumentation in accordance with the temporary excavation support plan. Notify the Engineer or City’s representative immediately if any geotechnical instrumentation is damaged. Repair or replace damaged geotechnical instrumentation at the sole option of the Engineer and at no additional cost to the City.

H. Continuously monitor movements of the ground adjacent to excavation support systems and adjacent structures. If the measured movements approach or exceed the allowable movements, take immediate steps to arrest further movement by revising procedures such as providing supplementary bracing, filling voids behind the trench box, supporting utilities or other measures (Construction Contingency Plan) as required.

I. Notify utility Citys if existing utilities interfere with the temporary excavation support system. Modify the existing utility with the utility Citys' permission or have the utility City make the modifications at no additional cost to City.

3.02 GROUND DEFORMATION ADJACENT TO EXCAVATION SUPPORT SYSTEMS

A. Allowable Vertical (heave/settlement) and Lateral Movements: 2 inches [5 cm] maximum for the trench box excavation support system, and 1 inch [2.5 cm] maximum for other types of excavation support systems at any location behind the excavation support system.

B. Monitoring personnel shall use a procedure for reading and recording geotechnical instrumentation data which compares the current reading to the last reading during data collection to eliminate spurious readings.

C. Plot the observed ground deformation readings versus time. Annotate the plots with construction loading and excavation events having an impact on the readings. Evaluate plots by means of secondary rate-of-change plots to provide early warning of accelerating ground movements.

D. Notify the Engineer when the allowable ground deformation is exceeded.

E. Implement Construction Contingency Plan under direction of the temporary excavation support system designer and the Engineer.

3.03 REMOVAL OF EARTH RETENTION SYSTEM

A. Sheeting shall not be left in place.

B. Remove the temporary excavation support system without endangering the constructed or adjacent structures, utilities, or property. Immediately backfill all voids left or caused by withdrawal of temporary excavation support systems with bank-run gravel, screened gravel or select borrow by tamping with tools specifically adapted for that purpose.

C. When tiebacks are used, release tension in tiebacks as the excavation is backfilled. Do not leave tensioned tieback in place at the completion of the work.

D. The excavation support system left-in-place shall be cut-off a minimum of 2 feet below the bottom of the next higher foundation level or a minimum of 5 feet below finished grade.

3.04 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02222

EXCAVATION AND BACKFILL FOR UTILITIES AND STRUCTURES

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. Excavate, grade and backfill as required for underground piping systems and structures including appurtenances as shown on the Drawings and specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01340 – Shop Drawings

B. Section 02140 – Dewatering

C. Section 02160 – Temporary Excavation Support Systems

D. Division 3.

1.03 QUALITY CONTROL

A. Codes and Standards: Excavation and backfill work shall be performed in compliance with applicable codes, standards and requirements of governing authorities having jurisdiction in the area.

B. Testing and Inspection Service: An independent testing laboratory will be retained by the City to do appropriate testing as described in Section 01400, Testing and Inspection. The Contractor shall schedule its work so as to permit a reasonable time for testing before placing succeeding lifts and shall keep the laboratory informed of his progress. A minimum of 48 hours of notice shall be provided to the testing laboratory to mobilize its activities.

1.04 SUBMITTALS

A. General: Submit information and samples to the Engineer for review as specified herein in accordance with Section 01340, Shop Drawings.

B. Dewatering: See Section 02140 for Dewatering. If the quantity or nature of water withdrawn requires approval/permits from regulatory agencies, the Contractor shall procure such permits at its expense and submit copies to the Engineer and Owner before commencing the work. The Contractor will not be granted contract

time extensions due to dewatering permit processing delays or sampling requirements.

C. Bedding and Backfill Materials: The Contractor shall notify the Engineer of the off-site sources of bedding and backfill materials, and submit to the Engineer a representative sample weighing approximately 50 lbs. The sample shall be delivered to a location on site determined by the Engineer.

D. Sheeting System: Drawings of the sheeting system and design computations shall be submitted to the Engineer; however, the review of these drawings shall in no way relieve the Contractor of the responsibility to provide a safe and satisfactory sheeting and shoring system. Sheeting and shoring shall be designed by the Contractor, and the proposed design shall be sealed by a Professional Engineer registered in the State of Florida. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, it may order additional supports put in at the Contractor's expense.

## 1.05 SUBSURFACE INFORMATION

A. The Contractor shall be responsible for anticipating groundwater and understanding soil conditions and shall provide positive control measures as required. Such measures shall ensure stability of excavations, groundwater pressure control, prevention of tanks, pipes, and other structures from being lifted by hydrostatic pressures, and avoiding the disturbance of subgrade bearing materials.

## 1.06 TRENCH SAFETY ACT COMPLIANCE

A. The Contractor by signing and executing the contract is, in writing, assuring that it will perform any trench excavation in accordance with the Florida Trench Safety Act, Section 553.60 et. seq.. The Contractor has further identified the separate item(s) of cost of compliance with the applicable trench safety standards as well as the method of compliance as noted in the "Bid Forms" Section of the Contract front-end documents.

B. The Contractor acknowledges that this cost is included in the applicable items of the Proposal and Contract and in the Grand Total Bid and Contract Price.

C. The Contractor is, and the City and Engineer are not, responsible to review or assess the Contractor's safety precautions, programs or costs, or the means, methods, techniques or technique adequacy, reasonableness of cost, sequences or procedures of any safety precaution, program or cost, including but not limited to, compliance with any and all requirements of Florida Statute "Trench Safety Act". The Contractor is, and the City and Engineer are not, responsible to determine if any safety or safety related standards apply to the project, including but not limited to, the "Trench Safety Act".

1.07 PROTECTION OF PROPERTY AND STRUCTURES

A. The Contractor shall, at its own expense, sustain in place and protect from direct or indirect injury, all pipes, poles, conduits, walls, buildings, and all other structures, utilities, and property in the vicinity of its Work. Such sustaining shall be done by the Contractor. The Contractor shall take all risks attending the presence or proximity of pipes, poles, conduits, walls, buildings, and all other structures, utilities, and its Work. It shall be responsible for all damage, and assume all expenses, for direct or indirect injury and damage, caused by its Work, to any such pipe, structures, etc., or to any person or property, by reason of injury to them, whether or not such structures, etc., are shown on the Drawings.

B. Barriers shall be placed at each end of all excavations and at such places as may be necessary along excavations to warn all pedestrian and vehicular traffic of such excavations. Barricades with flashing lights shall also be placed along excavation from sunset each day to sunrise of the next day until such excavation is entirely refilled, compacted, and paved. All excavations shall be barricaded where required to meet OSHA, local and Federal Code requirements, in such a manner to prevent persons from falling or walking into any excavation within the site fenced property limits.

1.08 EXISTING UTILITIES

A. Locate existing underground utilities in the areas of work. Test pits and hand excavation in critical areas will be required prior to initiating work. Identify potential conflicts ahead of construction.

B. The Contractor shall coordinate relocation of utilities with utility companies having jurisdiction in the area. Should unknown or incorrectly identified piping or other utilities be encountered during excavation, the Contractor shall consult the City, Engineer and Owner of such piping/utility for directions.

C. The Contractor shall cooperate with the City and utility companies in keeping respective services and facilities in operation and support and protect all existing utilities at all times.

PART 2 - PRODUCTS

2.01 BEDDING MATERIAL

A. All materials are to comply with the latest FDOT standards and specifications.

B. Bedding materials shall be furnished from acceptable off-site sources. The Contractor shall submit to the Engineer the sources of each material for review in accordance with Section 01340, Shop Drawings.

C. Crushed stone (or drainfield limerock) shall be used as bedding material for piping (except for copper pipe) and/or manholes as shown on the Standard Details

when the installation is below the ground water table elevation. Crushed stone shall consist of hard, durable, sub-angular particles of proper size and gradation, and shall be free from organic material, wood, trash, sand, loam, clay, excess fines, and other deleterious materials.

1. For pipe diameters less than 24 inches, the stone shall conform to the requirements of ASTM C 33, Size No. 57 (3/4-inch rock) and be graded within the following limits:

| Sieve Size | Percent Finer by Weight |
|---|---|
| 1-½ inch | 100 |
| 1 inch | 95 - 100 |
| ½ inch | 25 - 60 |
| No. 4 | 0 - 10 |
| No. 8 | 0 – 5 |

2. For bedding of 24 inch and larger diameter pipe, the stone shall conform to the requirements of ASTM C 33 and be graded within the following limits:

| Sieve Size | Percent Finer by Weight |
|---|---|
| 5/8 inch | 100 |
| 1/2 inch | 40 – 100 |
| 3/8 inch | 15 - 45 |
| No. 10 | 0 – 5 |

D. Sand shall be used for bedding pipe when installed under dry trench conditions, or above the ground water table. Sand shall also be used for bedding copper pipe under all conditions. Sand shall be dry, screened, graded sand with 100 percent passing a 3/8-inch sieve and not more than 5 percent passing a No. 200 sieve.

E. Limerock screenings, sand or other fine material shall not be used for bedding.

F. All pipe bedding material shall be new, unless otherwise approved by the Engineer. Existing pipe bedding material may not be used.

G. Suitable For Fills: Material classified as A-1, A-3, or A-2-4 under AASHTO M 145, free from vegetation and organic material, and with not more than 10 percent by weight passing the No. 200 sieve.

H. Unsuitable for Fills: Materials classified as A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7 and A-8 under AASHTO M 145.

I. Select Material: Suitable material containing no pieces or rock fragments larger than will pass a 3-inch diameter ring.

2.02 SELECT BACKFILL

A. Select Backfill: Select backfill shall be clean sandy material passing through a 3/4-inch sieve as select backfill material.

2.03 GENERAL BACKFILL

A. All other backfill (general backfill) placed above the select backfill shall pass through a 6-inch ring. General backfill shall contain no more than 10 percent organics. General backfill used under roadways shall be compatible with the materials and compaction specified in FDOT standards and specifications.

2.04 STRUCTURAL BACKFILL

A. Fill material shall be non-cohesive, non-plastic, granular mixture of local clean sand or local clean sand and limerock free from vegetation, organic material, muck or deleterious matter. Material shall conform to AASHO-2 gradation with no more than ten (10) percent by weight passing the No. 200 sieve. All rock or hard material shall pass through a 3-inch diameter ring. Broken Portland cement or asphaltic concrete shall not be considered an acceptable fill material. Fill material containing limerock shall have sufficient sand to fill the voids in the limerock. Material placed in the upper 6-inches of all backfills or fills shall not contain any stones or rocks larger than 1-inch in diameter. Limits of excavation and fill shall be as defined on the Drawings. All structural fill materials shall be obtained from off-site sources.

2.05 EXCAVATABLE FLOWABLE FILL

Excavatable flowable fill is called for on the Drawings where limited cover over the existing piping may exist due to conflicts with existing utilities or areas where it is not deemed feasible to go under the existing utility piping. The excavatable flowable fill shall be used in these instances for backfill and shall be placed around the piping conflict such that a layer is formed surrounding both the existing and the proposed or “new” piping with a minimum distance of 3 feet outside of the outer diameters of the intersecting piping and to finished grade elevation. Flowable fill contains a low cementitous content to reduce strength developments for possible future removal. Compressive strength testing shall be governed by the guidelines set forth in FDOT Standards and Specifications. See Section 03375 – Flowable Fill for additional requirements.

PART 3 - EXECUTION

3.01 EXCAVATION

The maximum amount of open trench permitted in any one (1) location shall be one hundred feet (100'), unless the trench is located within a State or County right-of-way, in which case the requirement would defer to the more stringent of those agencies.

A. Examine the areas and conditions under which excavating, filling, and grading are to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected. Notify the City and Engineer of unexpected subsurface conditions and discontinue work in affected area until notification to resume work.

B. Examine and accept existing grade of the project site walkways, pavements, etc., prior to commencement of work and report to Engineer if elevations of existing subgrade substantially vary from elevations shown on the Drawings.

C. The Contractor shall perform all excavation of every description and of whatever substance encountered, to the dimensions, grades and depths shown on the Drawings, or as required for a proper installation. All excavations shall be made by open cut and in accordance with the Trench Safety Act. All existing utilities such as pipes, poles and structures shall be carefully located, supported and protected from injury; in case of damage, they shall be restored at the Contractor's expense.

1. When excavations are to be made in paved surfaces, the pavement shall be saw-cut ahead of the excavation by means of a suitable sharp tools to provide a uniform sharp edge, with minimum disturbance of remaining material.

D. Pipe trenches for piping shall be excavated to a width within the limits of the top of the pipe and the trench bottom so as to provide a clearance on each side of the pipe barrel, measured to the face of the excavation, or sheeting if used, of 8 inches to 18 inches as defined on the Drawings. Where the pipe size exceeds 12 inches, the clearance shall be from 12 inches-to-18 inches. All pipe trenches shall be excavated to a level where suitable material is reached, a minimum of 8 inches below the pipe barrel or that will allow for a minimum of 36 inches of covering unless otherwise indicated on the Drawings.

E. Ladders or steps shall be provided for and used by workmen to enter and leave trenches as per OSHA standards.

F. Excavated unsuitable material shall be removed from the site and disposed of by the Contractor. Materials removed from the trenches shall be stored and in such a manner that will not interfere unduly with traffic on public roadways and sidewalks and shall not be placed on private property. In congested areas, such materials that cannot be stored adjacent to the trench or used immediately as backfill shall be removed to other convenient places of storage acceptable to the City at the Contractor's expense.

G. Excavated material that is suitable for use as backfill shall be used in areas where sufficient material is not available from the excavation. Suitable material in excess of backfill requirements shall be disposed off-site at the Contractor's expense and with no additional cost to the Owner.

H. Unless otherwise indicated on the Drawings, all excavation for structures shall be made in such a manner, and to such widths, as will give ample room for properly constructing and inspecting the structures they are to contain. Excavation shall be made in accordance with the details shown on the Drawings, and as specified herein. Attention shall be given to the proper handling of storm water runoff. The Contractor shall intercept and collect surface run off both at the top and bottom of cut slopes. The excavating equipment shall operate in an organized fashion so as to remove silt from one edge of the excavation to the other so as not to trap silt within the undercut area.

I. Over-excavation When Ordered:

1. Trenches shall be over-excavated beyond the depth shown, when ordered by the City or Engineer. Such over-excavation shall be to the depth ordered.

2. The trench shall be refilled to the grade of the bottom of the pipe with either selected granular material obtained from the excavation, sand or crushed rock, at the option of the City or Engineer. When crushed rock bedding is ordered, the material shall be a well-graded material with maximum particle size of three-quarters of an inch (3/4").

3. Bedding material shall be placed in layers, brought to optimum moisture content, and compacted to ninety-eight percent (98%) of maximum density.

J. Over Excavation not Ordered, Specified or Shown:

1. Any over-excavation carried below the grade ordered, specified or shown, shall be refilled to the required grade with suitable selected granular material.

2. Refilled material shall be moistened as required and compacted to ninety-eighte percent (98%) of maximum density.

3. Work required due to over excavation when not ordered shall be performed by the Contractor at his own expense.

3.02 UNAUTHORIZED EXCAVATION

A. Excavation work carried outside of the work limits required by the Contract Documents shall be at the Contractor's expense, and shall be backfilled by the

Contractor at its own expense with structural fill, as directed by the Engineer. Where, in the judgment of the Engineer, such over-excavation requires use of lean concrete or crushed stone, the Contractor, at its expense, shall furnish and place such materials.

3.03 SHEETING AND BRACING

A. See Section 02160 Temporary Excavation and Support Systems

B. If the Engineer is of the opinion that at any point sufficient or proper supports, have not be provided, he may order additional supports put in at the Contractor's expense. The Contractor shall be responsible for the adequacy of all sheeting used and for all damage resulting from sheeting and bracing failure or from placing, maintaining and removing it.

3.04 REMOVAL OF WATER

General: It is a basic requirement of these Specifications that excavations shall be free from water before pipe or structures are installed. Removal of groundwater, or dewatering, shall be accomplished in accordance with the requirements of Section 02140, Dewatering.

3.05 TRENCH STABILIZATION

A. No claim for extras, or additional payment will be considered for cost incurred in the stabilization of trench bottoms which are rendered soft or unstable as a result of construction methods, such as improper or inadequate sheeting, dewatering or other causes. In no event shall pipe be installed when such conditions exist and the Contractor shall correct such conditions so as to provide proper bedding or foundations for the proposed installation at no additional cost to the City before placing the pipe or structures.

3.06 PIPE BEDDING IN DRY TRENCHES

A. Pipe trenches shall be excavated as described herein. The resulting excavation shall be backfilled with acceptable pipe bedding material, up to the level of the centerline of the proposed pipe barrel. This backfill shall be tamped and compacted to provide a proper bedding for the pipe and shall then be shaped to receive the pipe. Bedding shall be provided under the branch of all fittings to furnish adequate support and bearing under the fitting.

B. Any over excavation below the levels required for installation of the pipe shall be backfilled with acceptable bedding material, tamped, compacted and shaped to provide proper support for the proposed pipe, at the Contractor's expense.

3.07 BACKFILL

A. The Contractor shall not backfill trenches until the piping has been inspected and tested in accordance with Section 15995, Pipeline Testing and Disinfection.

B. Pipelines: Pipeline trenches shall be backfilled to a level 12 inches above the top of the pipe with select backfill. When placed in the dry, such material shall be placed in 9-inch layers, each compacted to the densities specified herein. Only hand operated mechanical compacting equipment shall be used within six inches of the installed pipe.

C. After the select backfill has been placed as specified above, and after all excess water has completely drained from the trench, general backfilling of the remainder of the trench may proceed. General backfill shall be placed in horizontal layers, the depth of which shall not exceed the ability of the compaction equipment employed, and in no event shall exceed a depth of 12 inches. Each layer shall be moistened, tamped, puddled, rolled or compacted to the densities specified herein.

D. Manholes and Vaults: Any excavation below the levels required for the proper construction of manholes or vaults shall be filled with Class B concrete. The use of earth, rock, sand or other materials for this purpose will not be permitted.

3.08 COMPACTION AND DENSITIES

A. Compaction of backfill shall be 98 percent of the maximum density where the trench is located under structures or paved areas, and 95 percent of the maximum density elsewhere. Methods of control and testing of backfill construction are:

1. Maximum density of the material in trenches shall be determined by ASTM D 1557.

2. Field density of the backfill material in place shall be determined by ASTM D 1556 or D 2922.

B. Density Test Locations for Pipelines: The compacted backfill/fill shall be tested for in-place density at the rate of one test location per 200 lineal feet (or fraction thereof) of trench, or as shown on the Drawings or as directed by the Engineer. The density tests shall be taken at the trench bottom and at each location in one foot intervals beginning from the top of the piping and ending at the final grade. At existing road or pavement crossings, a minimum of two (2) density tests per crossing per lift is required or as per FDOT standards and specifications require.

C. Inspection and Testing: As a minimum, an in-place density test will be made in each lift of compacted soil for every 2,500 square feet of area. The Contractor shall coordinate and cooperate with the testing laboratory and pay for all testing and any re-testing that is required due to insufficient densities. Additional time

for lack of coordination with the testing company will not be compensated for under any circumstances.

D. Trench backfill which does not comply with the specified densities, as indicated by such tests, shall be reworked and recompacted until the required compaction is secured, at no additional cost to the City. The costs for retesting such Work shall be paid for by the Contractor.

3.09 ADDITIONAL EXCAVATION AND BACKFILL

A. Where organic material, such as roots, muck, or other vegetable matter, or other material which, in the opinion of the Engineer, will result in unsatisfactory foundation conditions, is encountered below the level of the proposed pipe bedding material, it shall be removed to a depth of two feet below the outside bottom of the pipe or to a greater depths as directed by the Engineer and removed from the site. Sheeting shall be installed if necessary to maintain pipe trenches within the limits identified by the Engineer. The resulting excavation shall be backfilled with suitable backfill material, placed in 12-inch layers, tamped and compacted up to the level of the bottom of the proposed pipe bedding material. Sufficient compaction of this material shall be performed to protect the proposed pipe against settlement. Lean concrete may be used in lieu of backfill when pipe installation is in the wet or at the Contractor's option. Construction shall then proceed in accordance with the provisions herein.

B. Additional excavation (more than two feet below the pipe) shall be performed when ordered by the Engineer. Where organic or other material is encountered in the excavation, the Contractor shall bring the condition to the attention of the Engineer and obtain his determination as to whether or not the material will require removal, prior to preparing the pipe bedding. In areas where muck is located, the excavation of material up to two feet below the outside bottom of the trench width will be required to be removed and disposed of by the Contractor. The removal and disposal of up to two feet of muck below the pipe trench is considered incidental to the construction and the Work shall be done at no additional cost to the City which also includes replacing the muck with suitable pipe bedding material.

3.10 DISPOSAL

A. The Contractor shall remove and dispose of all excess excavated material at his own expense. All excess suitable material that cannot be used as fil on the site(s) is to remain the property of the City and shall be removed by the Contractor to a disposal site(s) as directed by the City or Engineer. All materials suitable for use as backfill shall be hauled to and used in areas where not enough suitable material is available from the excavations. All unsuitable material such as trees, shrubs,

etc, shall be the Contractor's responsibility to load, haul and provide a disposal site and their cost.

## 3.11 RESTORATION

A. Provide finished grading in accordance with Section 02260, Finish Grading.

B. Restore all green space areas disturbed by the trenching operations in accordance with Section 02500, Landscaping, and Section 02930, Sodding or as otherwise applicable.

END OF SECTION

SECTION 02225

CONTAMINATED SOILS AND GROUNDWATER

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. This Section includes, except as elsewhere provided, the work necessary to remove, transport, and properly dispose of contaminated soils and groundwater required for complete construction of structures and underground piping systems and appurtenances as shown on the Drawings and specified herein.

B. The Contractor is to review the County contaminated sites listing and to obtain the most current listing from the County's records, website, or other environmental departments for reference of locations which may potentially have contaminated groundwater and soils. Contaminated sites and the potential of contaminated groundwater and soils shall be the sole responsibility of the Contractor to identify and to follow regulatory requirements for all work within these areas.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 2.

1.03 QUALITY CONTROL

A. Codes and Standards: All work associated with dewatering, excavation, removal, transportation and disposal of contaminated soils and groundwater shall be performed in compliance with applicable codes, standards and requirements of governing authorities having jurisdiction in the area.

B. Testing and Inspection Service: A testing laboratory certified by the County Department of Regulatory and Economic Resources and the State of Florida shall be retained by the Contractor to conduct appropriate soils and groundwater testing in accordance with regulatory requirements and the Contract Documents.

1.04 SUBMITTALS

A. The Contractor shall submit information and samples to the City for review as specified herein in accordance with Section 01300. The information shall include:

1. Detailed description of the proposed methods for temporary stockpiling, transportation, and disposal of all contaminated soils and groundwater.

2. Copies of permits for all disposal facilities.

3. Copies of all manifest and documentation for handling and disposing of all contaminated soil and groundwater in full compliance with local, state and federal requirements. This documentation must be provided prior to requesting payment under this Bid item.

4. Copies of all laboratory analyses required for transportation and disposal of all contaminated soils and groundwater in full compliance with local, state and federal requirements.

5. Names, addresses and contact numbers of all subcontractors.

6. Copy of Contractor's Health and Safety Plan and training certificates of personnel who will be handling the contaminated material in accordance with OSHA requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONTAMINATED SOILS

A. The Contractor shall retain a laboratory certified by the County and the State of Florida to sample the groundwater in the excavation, the stored soil and soil samples in the perimeter of the excavated hole for petroleum contamination (EPA Methods 601, 602, 610). The number of samples shall be sufficient to comply with the requirements of the Contractor's approved Dewatering Plan and all local, state and federal regulations. The results of the tests shall be forwarded to the City.

B. Excavated materials which are deemed to be contaminated shall be removed, treated and disposed of by the Contractor in accordance with all applicable regulatory requirements. The soil may be contaminated with petroleum product which may be partly or entirely diesel fuel or gasoline. When such soil conditions are encountered, they shall be brought to the City's attention. The extent of excavation shall be determined in the field by the City.

C. All contaminated soil which is excavated shall be stockpiled in an area designated for contaminated soils. The Contractor shall take whatever precautions are necessary to ensure that contaminated soils are not co-mingled with non-contaminated stockpiled soils and/or mucks.

D. Contaminated soils must be placed on an impermeable barrier when temporarily stockpiled and must be covered with visquine to prevent runoff. All stockpile

leachate or runoff must be collected for disposal in accordance with federal, state and local regulations.

E. Contaminated soils shall be processed and treated at a state licensed facility. These soils shall be transported and disposed of in accordance with federal, state and local regulations.

F. The Contractor shall be responsible for testing soil which has been treated to certify treated soil meets applicable federal, state, and local regulations for final disposal.

3.02 CONTAMINATED GROUNDWATER

A. All water generated, pumped or removed from excavations as a result of excavation dewatering activities shall be collected, containerized, and managed prior to discharge and/or treatment at an approved discharge point in accordance with local, state and federal regulations and the requirements of the Contract Documents. If groundwater contamination is identified at any time during the performance of the Work, Contractor shall immediately notify the City.

B. If contaminated groundwater in the dewatering excavation area is encountered, the contaminated groundwater shall be removed, treated and discharged by the Contractor in accordance with all applicable regulatory requirements.

C. Treatment of contaminated groundwater will include the following options, depending on the magnitude of the contamination in the trench: Granular Activated Carbon (GAC) Treatment vessels, mobile air stripping units, vacuum truck removal and disposal or other method as approved by the City and regulatory agencies with jurisdiction.

D. If contaminated groundwater is encountered during construction, Contractor shall provide reference information for the qualified groundwater remediation subcontractor to be utilized, including phone number, contact name, and address. The selected groundwater treatment/recycling facility for hauling contaminated groundwater shall also be identified.

E. Effluent water from the treatment system will be analyzed by the certified laboratory to confirm that concentrations are below regulatory limits. Effluent water will then be directed to a pre-approved location as determined by local regulatory agencies and/or the City.

3.03 TRANSPORT AND DISPOSAL

A. Transport Regulations: The Contractor shall be responsible for the loading, labeling, placarding, marking, weighing, and transporting of all waste materials in accordance with the Florida Department of Transportation Regulations, and U.S.

Department of Transportation Regulations. The Contractor shall use only transporters that are licensed and competent to haul these wastes.

3.04 WASTE CONTAINERS

A. Each transport container of waste shall be visually inspected by the Contractor for leaks, drips, or container damage prior to being loaded. Containers which are found to be leaking or damaged shall not be loaded until the damage is repaired. The Contractor shall prepare the transport container to prevent spillage or contamination. The Contractor shall notify the City two hours before any loaded transport leaves the site.

B. All transport containers leaving the site shall be inspected by the Contractor to ensure that no waste material adheres to the wheels or undercarriage.

C. All vehicles on which waste is adhering shall be cleaned by sweeping tires and undercarriage or by other dry methods prior to leaving the site.

3.05 SHIPPING RECORDS

A. The Contractor shall prepare accurate shipping records for any wastes leaving the site in accordance with applicable federal and state regulations. The Contractor shall be responsible for providing copies of the records to the City and shall immediately notify the City of any problems in completing shipments and disposal of wastes.

B. The Contractor shall:

1. Be responsible for appropriate measurement of unit quantity (weight or volume) of waste material removed from the site.

2. Coordinate vehicle inspection and recording of quantities leaving the site with the City. These quantities shall be compared to recorded quantities received at the treatment or disposal facilities. The Contractor shall resolve any discrepancies occurring immediately, determining the probable cause for the discrepancy.

3. Be solely responsible for any and all actions necessary to remedy situations involving waste spiked in transit.

C. The Contractor shall ensure that a copy of the manifest is returned to the City by the designated treatment or disposal facility within 14 days of receipt of the material to be disposed.

END OF SECTION

SECTION 02260

FINISH GRADING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall, under this Section, supply, place, compact and roll finish grade materials prior to landscaping work.

B. Finish grade sub-soil.

C. Cut out areas to receive stabilizing base course materials for paving and sidewalks.

D. Place, finish grade and compact topsoil.

1.02 PROTECTION

A. The Contractor shall prevent damage to existing fencing, trees, landscaping, natural features, bench marks, pavement, utility lines, and sprinkler system. Correct and restore any damaged items at no cost to the City.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil shall be friable loam free from subsoil, roots, grass, excessive amount of weeds, stones and foreign matter; acidity range (pH) of 5.5 to 7.5; containing a minimum of 4% and a maximum of 25% organic matter.

2.02 CRUSHED STONE

A. Crushed stone for general grading purposes shall be hard, durable, subangular particles of proper size and gradation, and shall be free from organic materials, wood, trash, sand, loam, chalk, excess fines and other deleterious materials. Maximum aggregate size shall be ¾ inches.

PART 3 - EXECUTION

3.01 SUBSOIL PREPARATION

A. Rough grade subsoil systematically to allow for a maximum amount of natural settlement and compaction. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, etc., in excess of 2 inches in size. Remove sub-soil which has been contaminated with petroleum products.

B. Cut out areas, to subgrade elevation, which are to receive stabilizing base for paving and sidewalks.

C. Bring subsoil to required levels, profiles and contours. Make changes in grade gradual. Blend slopes in to level areas.

D. Slope grade away from building minimum 4 inches in 10 feet (unless indicated otherwise on Drawings).

3.02 PLACING TOPSOIL

A. Place topsoil in area where seeding, sodding and planting is to be performed. Place to the following minimum depths, up to finished grade elevations:

1. 6-inches for seeded areas.

2. 4 1/2-inches for sodded areas.

3. 24-inches for shrub beds.

4. 18-inches for flower beds.

B. Use topsoil in relatively dry state. Place during dry weather.

C. Fine grade topsoil eliminating rough and low areas to ensure positive drainage. Maintain levels, profiles and contours of subgrade.

D. Remove stones, roots, grass, weeds, debris and other foreign material while spreading.

E. Manually spread topsoil around trees, plants, buildings and other structures to prevent damage which may be caused by grading equipment.

F. Lightly compact placed topsoil.

3.03 SURPLUS MATERIAL

A. Remove surplus sub-soil and topsoil from site.

B. Leave stockpile areas and entire job site clean and raked, ready to receive landscaping and or sodding.

END OF SECTION

SECTION 02500

LANDSCAPING

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. Items specified in this Section include the installation of new landscaping, or repairs to existing landscaped and grassed areas that may be damaged or disturbed by Contractor activities. The Contractor is to protect existing trees and landscaping, obtain approvals prior to trimming or removal, and replace in kind if removal is approved by the City.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 2.

1.03 SUBMITTALS

A. The Contractor shall submit submittals for review in accordance with the Section 01340 – Shop Drawings.

1.04 DEFINITIONS

A. FDOT Specifications shall refer to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition. The FDOT Specifications are referred to herein and are hereby made a part of this Contract to the extent of such references, and shall be as binding upon the Contract as though reproduced herein in their entirety.

1.05 PROTECTION OF EXISTING IMPROVEMENTS

A. The Contractor shall be responsible for the protection of all pavements and other improvements within the work area. All damage to such improvements, as a result of the Contractor's operations, beyond the limits of the work of pavement replacement shall be repaired by the Contractor at his expense.

1.06 GUARANTEE

A. The Contractor shall guarantee all trees, ground cover or shrubs planted or replanted under this Contract for a period of one year beyond closeout of the project. In the event that any new tree, plant or shrub dies within the guarantee period, the Contractor shall be responsible for replacement in kind. In the event that a transplanted (reused) tree dies within the guarantee period, the Contractor shall be responsible for replacement in kind, except that the maximum height of

any new tree shall be eight feet as measured from the ground surface, once planted, to the top of the tree.

## PART 2 - PRODUCTS

### 2.01 REPLACEMENT TREES, GROUND COVER AND SHRUBS

A. Replacement trees, ground cover and shrubs shall be of the same type and size and sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall have healthy, well developed root systems and shall be free of disease and insect pests, eggs or larvae.

### 2.02 MULCH

A. Mulch shall be windproof shredded eucalyptus, mulch shall be clean, fresh, free of branches and other foreign matter. Mulch shall be used around all shrubs, ground covers and tree trunks, and placed to a minimum depth of 2 inches extending from the tree trunk outward two feet.

### 2.03 GRAVEL BEDS

A. Filter Fabric: Filter fabric shall be nonwoven polyester material Trevia Type 1120 as manufactured by Hoechst Fibers Industries, or equal. Fabric weight shall be 6 ounces per square yard, puncture strength maximum 40 pounds, minimum Flux 240 gallons per minute per square foot. Fabric shall be installed in accordance with the manufacturer's recommendations, with precautions taken to avoid tearing the fabric. Fabric shall be laid in strips with a minimum overlap of one foot.

B. Limerock: Limerock shall meet ASTM A57 standards and shall be prewashed. Maximum size shall be 3/4 inches. Limerock shall be carefully placed and spread on the fabric to a minimum depth of 6 inches. Final grades and locations shall be as designated on the Drawings.

## PART 3 - EXECUTION

### 3.01 GRADING AND SODDING

A. Finished grading to be provided in accordance with Section 02260.

B. Sodding to be provided in accordance with Section 02930.

### 3.02 TREES, GROUND COVER AND SHRUBS

A. Excavation and Plant Holes: Plant hole excavations shall be roughly cylindrical in shape, with the side approximately vertical. Plants shall be centered in the hole.

Bottoms of the holes shall be loosened at least six inches deeper than the required depth of excavation.

B. Holes for balled and burlaped plants shall be large enough to allow at least eight inches of backfill around the earth ball. For root balls over 18 inches in diameter, this dimension shall be increased to 12 inches. Where excess material has been excavated from the plant hole, the excavated material shall be disposed of as and where directed by the Engineer.

C. Setting of Plants: The Contractor, when setting plants in holes, shall make sure that when lowered into the hole, the plant shall rest on a prepared hole bottom such that the roots are level with, or slightly above, the level of their previous growth and so oriented such as to present the best appearance.

D. Palms of the Sabal species may be set deeper than the depth of their original growth, provided that the specified clear trunk height is attained.

E. The backfill shall be made with planting mixture and shall be firmly rodded and watered-in, so that no air pockets remain. The quantity of water applied immediately upon planting shall be sufficient to thoroughly moisten all of the backfilled earth. Plants shall be kept in a moistened condition for the duration of the Contract.

F. Staking and Guying: Plants shall be staked in accordance with the following provisions:

1. Small Trees: For trees and shrubs of less than one-inch caliper, the size of stakes and the method of tying shall be such as to rigidly support the staked plant against damage caused by wind action or other effects. Trees larger than one inch and smaller than one and one-half inch caliper shall be staked with a two-inch stake, set at least 24 inches in the ground and extending to the crown of the plant. The plant shall be firmly fastened to the stake with two strands of 14 gauge soft wire, enclosed in rubber hose, or other approved covering. The wire shall then be nailed or stapled to the stake to prevent slippage.

2. Medium Trees: All trees, other than palm trees, larger than one and one-half inch caliper and smaller than two and one-half inch caliper shall be staked with two or more, two-inch by two-inch stakes, eight feet long, set two feet in the ground. The tree shall be midway between the stakes and held firmly in place by two strands of 12-gauge wire, applied as specified above for single stakes. The wires shall be tightened and kept tight by twisting.

3. Large Trees: All trees, other than palm trees, larger than two and one-half inch caliper, shall be braced with three or more two-inch by four-inch wood braces, toenailed to cleats which are securely banded at two pints to the palm, at a point at least six feet above the ground. The trunk shall be

padded with five layers of burlap under the cleats. Braces shall be approximately equidistantly spaced and secured underground with two-inch by four-inch by 24-inch stake pads. In firm rock soils, Number 4 steel reinforcing rods or one-half inch pipe is acceptable.

4. Palm Trees: Palm trees shall be braced with three or more two-inch by four-inch wood braces, toenailed to cleats which are securely banded at two points to the palm, at a point at least six feet above the ground. The trunk shall be padded with five layers of burlap under the cleats. Braces shall be approximately equidistantly spaced and secured underground with two-inch by four-inch by 24-inch stake pads. In firm rock soils, Number 4 steel reinforcing rods or one-half inch pipe is acceptable.

G. Pruning: All broken or damaged roots shall be cut off smoothly, and the tops of all trees shall be pruned in a manner complying with standard horticultural practice. At the time pruning is completed, all remaining wood shall be alive. All cut surfaces of one inch or more in diameter, above the ground, shall be treated with approved commercial tree paint.

H. Maintenance: Maintenance shall begin immediately after each plant is planted and shall continue until all work under this Contract has been completed and accepted by the City. Plants shall be watered, mulched, weeded, pruned, sprayed, fertilized, cultivated and otherwise maintained and protected. Settled plants shall be reset to proper grade position, planting saucer restored and dead material removed. Guys shall be tightened and repaired.

I. Defective work shall be corrected as soon as possible after it becomes apparent. Upon completion of planting, the Contractor shall remove excess soil and debris, and repair any damage to structures, etc., resulting from planting operations.

3.03 GRAVEL BEDS

A. Clean, grade and place geotextile prior to placing gravel in gravel beds.

END OF SECTION

SECTION 02515

WATER SERVICE CONNECTIONS AND TRANSFERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Contract Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. This section covers the work necessary for service connections, laying service pipe, casing pipe, making connections to the new water main and to the existing service pipe, testing and flushing, and all incidental work necessary to accomplish the construction.

B. The work includes trench excavation, backfill and compaction, furnishing and installing service clamps, corporation stops or valves, meter yokes or connections, service connection piping, fittings, and appurtenances within the designated limits, testing, flushing, and other incidental work as required for a complete installation. Included are the installation and transfers of 5/8-inch, one (1) inch, 1½ inch, and two (2) inch meter connections within the limits shown on the plans.

C. The approximate location of service connections to be installed or transferred will be all reconnections of existing services, at a minimum with other service connections suggested by the Contractor and approved by the Engineer and City.

D. All new domestic services shall be Polyethylene tubing per City Standards.

E. Contractor shall coordinate all work with City staff prior to any proposed shut downs or isolation of the existing system for tie-ins.

1.03 RELATED WORK

A. See Divisions 2 and 15.

PART 2 - PRODUCTS

2.01 EXCAVATION AND BACKFILL

A. Excavation shall conform to the requirements of Section 02222 - Excavation and Backfill for Utilities and Structures.

2.02 MISCELLANEOUS FITTINGS

A. Refer to Section 15001 – Water Services and Miscellaneous Fittings.

2.03 SERVICE CONNECTION SIZE

A. The location and size of service connection to be transferred or installed will be as determined in the field by Contractor. The new meter boxes will be furnished and installed by the Contractor. If a new water meter is to be installed by the Contractor, a Class III water License Certification is required and the City will pay for the new meter.

PART 3 - EXECUTION

3.01 TRENCH EXCAVATION AND BACKFILL

Conform to the requirements of Section 02222 - Excavation and Backfill for Utilities and Structures.

3.02 CONNECTION TO MAIN

A. Clean exterior of main of dirt or other foreign matter that may impair the quality of the completed connection. Then place service clamp at the desired location and clamp tight by tightening alternate nuts progressively. Do not place service clamp within one (1) foot of pipe joint or other clamp.

B. Taps shall be made in the pipe by experienced workmen using tools in good repair with the proper adapters for the size main being tapped.

3.03 PREPARATION OF TRENCH

A. Grade the bottom of the trench by hand to the line and grade to which the pipe is to be laid, with proper allowance for special bedding. All other conditions and operations as specified in Section 02222 must be adhered to. The trench bottom shall form a continuous and uniform bearing support for the pipe. A six (6) inch layer of imported earth or other specified material will be required over and under pipe in areas where suitable trench side material is not available.

3.04 UNDERCROSSING OF ASPHALT-SURFACED ROADS

A. Service connection piping under asphalt-surfaced roads shall be bored or jacked or as otherwise shown on the Drawings. Open cutting of asphalt-surfaced roads is not permitted except at the direction of the Engineer or as shown on the Drawings. The service connection pipe shall be installed so that it has a minimum cover of two (2) feet with a slight grade sloping away from the water main.

3.05 POLYETHYLENE PLASTIC TUBING

A. Refer to Section 15001 – Water Services and Miscellaneous Fittings.

3.06 RECONNECTION OF EXISTING METERS

The work involves reconnecting existing water meters to new water mains and placing the existing water mains out of service.

A. There shall be no water service interruptions without prior notice to the property owner/occupant, and without the authorization of the City.

B. Existing services shall not be disconnected from existing water mains until the new replacement water mains have been completely installed, successfully tested, accepted by the City, and released for service by the Miami-Dade County Department of Health.

C. Existing water mains serving active potable water services, irrigation systems, fire sprinkler services, fire hydrants, etc., shall remain in service until all existing services and hydrants have been successfully reconnected to the new replacement water mains.

D. Existing metered services that are to be transferred from existing mains to new water mains shall include new water service piping between the new main and the meter, and shall also include replacement of the existing curb stop as part of the Contract. See City Standard details for additional requirements for tying in metered connections.

3.07 HYDROSTATIC TEST AND LEAKAGE

A. Test service connections and service connection tubing by either testing in conjunction with the main at the test pressure required for the main, or by testing at the normal hydrostatic main pressure after the main has been completely installed and tested. Inspect visually for leaks and repair any leaks before backfilling. Sufficient sampling points shall be taken from service line connections to assure uniform results throughout the system being tested Duration of the test shall be at least fifteen (15) minutes.

3.08 DISINFECTION

A. Service connection transfers shall be disinfected as follows:

1. Make connection to the main pipeline which shall have been previously hydrostatically tested and disinfected.

2. Prior to connecting plastic tubing to existing copper tubing or meter stop, flush new plastic tubing by fully opening corporation stop and allowing water to run for 2 minutes.
3. Close corporation stop and meter stop, connect new plastic tubing to existing copper tubing or to meter stop, as applicable. Open corporation stop and allow to stand for a minimum of 30 minutes retention period. Open meter stop.

B. The City may put extra chlorine in the water system during the time of service connection transfers to provide sufficient chlorine residual to adequately disinfect service connections when the above procedure is followed.

END OF SECTION

SECTION 02930

SODDING

PART 1 - GENERAL

1.01 SCOPE

A. Provide all labor, materials and equipment necessary for complete sodding of areas affected by construction. This shall include, but not be limited to: liming, fertilizing, sodding, necessary barriers, tests and all incidentals to make the work complete.

1.02 WORK INCLUDED

A. Testing of topsoil.

B. Raking and leveling topsoil as required for sodding.

C. Liming and fertilizing of topsoil.

D. Laying and rolling of sod.

E. Maintaining

1.03 SUBMITTALS

A. Submit product source and information sheets in accordance with Section 01340, Submittals.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fertilizer

1. Fertilizer shall be commercial fertilizer, as manufactured by International Chemical Company or equal.

2. Said fertilizer shall have a 10-20-6 N.P.K. content and contain a minimum of 60% of organic material or as otherwise approvable to the City.

3. It shall be delivered at the site in the original sealed containers.

B. Sod

1. Sod from right-of-way swales within the work area shall be Bahia sod or replaced in-kind, whichever is finer quality.

2. Sod shall be first quality Bahia sod of firm texture having a compacted growth and good root development.

3. Sod shall be absolutely true to varietal type, live, fresh and free from weeds or objectionable vegetation, fungus, insects and disease of any kind. Sod shall be kept moist from the time it is field cut until it is laid at the proposed site.

4. The sod shall be as grown by a certified turf nursery and Contractor shall inform Engineer as to the source of the sod to be utilized prior to ordering and delivery of sod.

5. Sod shall be furnished and installed in rectangular sod strips measuring 12 to 16-inches in width of standard lengths of not less than 2 feet and delivered on pallets.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

A. These areas shall be fine graded to achieve the finished subgrade after compaction which shall be obtained by rolling, dragging or by an approved method which obtains an equivalent compaction to that produced by a hand roller weighing from 75 to 100 pounds per foot of width. All depressions caused by settlement or rolling shall be filled with additional existing or furnished topsoil and regraded and prepared as specified above until it presents a reasonably smooth and even finish at the required sod sub-grade.

B. All sod furnished shall be living sod containing at least 70% of thickly matter grasses as specified and free from noxious weeds. All sod shall be certified free of fire ants.

C. No broken pads or torn or uneven ends will be accepted. Standard size sections of sod shall be strong enough to support own weight and retain their size and shape when suspended vertically with a firm grasp on the upper 10% of the section. Sod shall not be harvested when its moisture content (excessively wet or dry) may adversely affect its survival.

D. Sod shall be harvested, delivered, and installed within a period of 24 hours. Sod not installed within this time period shall be subject to inspection and rejection by Engineer, and shall be removed from the site and a fresh sod supply shall be furnished at no extra cost to City.

E. The topsoil shall not be moist at time of installation; however, it shall contain sufficient moisture so as not be powdery or dusty, both as determined by the supplier's representative.

F. The overlapping of existing lawn with new sod along limit of work lines will not be permitted. Sod shall be laid in strips, edge to edge, with the lateral joints staggered. All minor or unavoidable openings in the sod shall be closed with sod plugs or with topsoil, as directed by Engineer. However, sod laid with joints determined to be too large shall be lifted and re-laid as specified herein at no extra cost to City.

G. Immediately after the sod is laid, the sod shall be watered thoroughly by hand or mechanical sprinkling until the sod and at least 2-inch of the top soil bed have been thoroughly moistened.

H. Contractor shall be responsible to furnish his own supply of water to the site at no extra cost. If possible, City shall furnish Contractor, upon request, with a source and supply of water. Contractor shall apply for temporary meter and pay City for water used at current utility billing rates. However, if City’s water supply is not available or not functioning, Contractor shall be responsible to furnish adequate supplies at his own cost. All work injured or damaged due to the lack of, or the use of too much water, shall be Contractor's responsibility to correct.

3.02 MAINTENANCE

A. Maintain the entire sodded areas at least a 30-day period or until final acceptance at the completion of the Contract, whichever is longer. Maintenance shall include watering as specified, weeding and removal of stones which may appear. All bare or dead spots which become apparent shall be properly prepared, limed and fertilized, and resodded at Contractor's expense as many times as necessary to secure a good growth. In the event that the sod installation is not accepted by Engineer, the entire area shall be maintained and cut by Contractor until final acceptance of the sod installation.

B. Take whatever measures are necessary to protect the sod while it is developing. These measures shall include furnishing of warning signs, barriers, or any other necessary measures of protection.

END OF SECTION